



# Mathematics

OSPI/AESD Evaluation Brief, 2018-2019 School Year

**AESD** ASSOCIATION OF  
EDUCATIONAL  
SERVICE DISTRICTS

Nine ESDs. One Network.  
Supporting Washington's Schools and Communities.

## Student Learning Exploration

Throughout Washington State, Regional Content Coordinators provide information from state education leaders to school districts spanning 71,362 square miles, from the snow-capped Cascade Mountains to the forested islands of Puget Sound to the rich agricultural fields in Eastern Washington. The Regional Coordinators work diligently in their Educational Service Districts (ESD) to share resources from the Office of Superintendent of Public Instruction (OSPI) that address equity, standards, and assessments with teachers to help improve instruction and student learning. They offer professional development courses throughout the year and work within schools, in cooperation with teachers, instructional coaches, and administrators, to support instruction through professional learning communities, classroom demonstrations, and embedded coaching practices. One venue of professional development is the OSPI/ Association of Education Service Districts (AESD) Fellows' Network. This Fellows' Network is a 3-year program led by Regional Coordinators who teach leadership and instructional strategies<sup>1</sup>.

To better understand how Regional Coordinators' efforts may influence student achievement, the Kauffman & Associates, Inc., (KAI) evaluation team guided Regional Coordinators from all nine ESDs and four content areas through a series of conversations in September 2016. With diligent attention to detail, the Regional Coordinators shared the multi-faceted nature and intended outcomes of their work. After reviewing all of this information, KAI created a Theory of Action<sup>2</sup> based on these conversations to depict how the Regional Coordinators' actions and tasks lead to the desired outcomes, including increased student learning.

This brief explores how the Fellows' Network Convenings influenced the leadership and instructional practice of a K-6 Elementary Math and Science Specialist, Sara Alvarado. Dr. Janet Gordon, KAI Senior Researcher, used a participatory approach to conduct research for this brief that analyzed quantitative (assessment scores) and qualitative (classroom work, interviews) data to tell the story. Ms. Alvarado's cycle began with professional learning in the Fellows' Convenings, progressed to classroom implementation and practice adjustments, and resulted in the influence on students.

### Spotlight – Mathematics

Ms. Sara Alvarado is a K–6 Elementary Math and Science Specialist at Centralia School District in Centralia, WA, located in ESD 113. The students come from the following racial backgrounds: 57% White; 36% Hispanic; 4% two or more races; and 1% or less Asian, African American, American Indian, and Native Hawaiian. Of these students, 89% participate in the free or reduced lunch program. Many of the students experience food insecurity at home and other

<sup>1</sup> Visit <http://www.k12.wa.us/CurriculumInstruct/Fellows.aspx> to learn more about the Washington State Fellows Network.

<sup>2</sup> Visit <https://bit.ly/28NRSuZ> to learn more about the Theory of Action.

stressors due to poverty and other environmental variables. The incoming kindergarteners struggle with social emotional skills and early numeracy skills. Elementary teachers prioritize relationship building, consistent daily schedules, and reliable learning environments for their students. This work is critical for classroom success.

Ms. Alvarado has been a Math and Science Specialist for three years. She supports approximately 90 math and science teachers and instructional facilitators across five elementary schools. She provides classroom support, professional learning community (PLC) support, and professional development sessions for the district.



Sara Alvarado, Elementary Math Specialist

## Professional Learning

Ms. Alvarado has been an active participant in ESD professional development opportunities and has been in the Fellows' Network for three years. She continually shares what she learned in the Fellows Convenings with her colleagues.

Two of her most profound learning experiences came from Jo Boaler's book, *Mathematical Mindsets*, and learning about the Concerns-Based Adoption Model (CBAM)<sup>3</sup>. She described how reading *Mathematical Mindsets* resulted in her first step in making instructional shifts. She explained:

*This book, along with other research by Jo Boaler, was the first step in recognizing changes that I needed to make in my own learning and understanding of powerful mathematics instruction and what that meant for me as an instructional specialist—and a teacher. Then identifying that to positively impact the greatest number of teachers and kids, [and the] systemic changes [that] had to be made at the classroom, building, and district level.*

Regarding CBAM, Ms. Alvarado uses the CBAM model to develop a culture of learning and shared leadership among her peers. She uses her knowledge and skills from CBAM to guide other teachers to make instructional changes and adopt mathematical mindsets. She explained, *"The tremendous shift that we are seeing in classrooms, that is teachers redefining for themselves what math is and who can do math--isn't about me... It's much bigger than me. It's*

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<sup>3</sup> CBAM is a framework for measuring implementation and for facilitating change in schools. Visit <http://www.sedl.org/cbam/> to learn more about CBAM.

*the shared leadership and building a culture of learning in the whole school ... that becomes the fabric of the community [to] sustain this. You need to have the philosophy and belief."*

She shared how the Fellows' Network helped build a foundation for her to learn and apply her knowledge. For example, through the Fellow's Convenings, Ms. Alvarado learned how to effectively lead others through the Stages of Concern. She explained:

*If you don't have the philosophy or the belief behind the strategy, it's not going to be as impactful... So, I lead conversation[s] with educators to unpack some beliefs, and then move forward from there. I tell people I'm pushing edges, and I am doing so gently because I don't want to burn bridges or ruin a relationship ... [as] we move forward in a meaningful way and have a real dialog and conversation around these issues.*

## Application of Knowledge and Skills Learned

Once Ms. Alvarado was comfortable and confident with the changes she had made in her own personal beliefs about math learning, her next goal was to fully integrate her ideas into the school. She explained, *"There is so much to take into account when teaching adults. How are you able to make [mathematical mindsets] a culture instead of [it being] regimented? How do I lead discussions on people's beliefs about math?"*

Ms. Alvarado explained that she began introducing Boaler's resources to the teachers by asking them questions that prompted deep thought and potential transformational shifts. She asked them, *"Why be a math educator? What are your beliefs and core values you hold close to yourself? Do you know when they are being challenged? How do you react? How does that get in the way of collaboration?"* Using herself as an example, Ms. Alvarado told them, *"When [my beliefs are] challenged, my first reaction is to close my door, rather than collaborate and move forward."* She explained to her peers that, by acknowledging her emotions, she was able to reflect, react, and then push forward to have conversations with colleagues. She described how the teachers she spoke with slowly changed their perceptions from feeling like they were being challenged to valuing the cycle of inquiry. She explained:

*There are so many components about beliefs about math. I asked [the teachers], "When do you need your belief to be backed up by research?" The teachers in the moment didn't appreciate the reflection, but afterward, they have asked their administrator for reflection time built into their professional learning community.*

Informed by CBAM strategies, Ms. Alvarado guided teachers through reflection of their math practice. Ms. Alvarado noted that this exercise helped teachers progress from having low expectations of their students to realizing that *"all kids are capable of learning at high levels."* Some teachers began to release their unproductive strategies, which were based on their old beliefs, for those strategies that might better support their students. She said they started wondering, *"How are they going to talk about math? How can [students] show they are learning? How we can connect strategies?"* She told the teachers, *"It's okay that somebody did [the math] differently... How can we both get the same answer and do something different?"*

This process helped build the teachers' mathematical mindsets. She explained that the teachers were more *"accepting of mistakes, and [they] use mistakes as a jumping-off point for some big learning in the classroom."*

Ms. Alvarado persevered through criticism and reluctance, and now teachers are supportive of her ideas. Most of the grade levels have incorporated Boaler's work into their scope and sequence, she explained, *"to revitalize and strengthen the math climate and culture in their classrooms."* Teachers in several grade levels, especially fifth grade, use Boaler's activities to introduce a new unit or to wrap up a unit and help students connect with their math education. Ms. Alvarado described the progress made in implementation:

*Our teachers are really working on looking at the curriculum, using strategies such as Number Talks, Routines for Reasoning, My Favorite Know, Notice/Wonder, 3 Reads, etc., to get students to access the math. More teachers are letting go of workbook pages and are embracing the talking, grappling, thinking, reflecting, and showing. Our goal is [to understand] a few really good problems versus doing many problems for the sake of quantity.*

Ms. Alvarado successfully supports teachers through difficult conversations. The teachers value the resultant deep learning and request that more time be set aside for reflection. She added, *"If [teachers] don't feel that ... the systems [are] in place to support [new] learning, [teachers] can feel like [they] are drowning."*

## Influence on Student Achievement

The influence of Ms. Alvarado's professional development on student achievement can be seen after two years. To recap, in the 2016-17 school year, Ms. Alvarado conducted professional development classes for elementary school teachers on Boaler's philosophy and growth mindsets (e.g., Number Talks). The teachers who attended these classes discussed the materials in their PLCs to prepare to include them in their practice. Ms. Alvarado shared, *"This is the second year of implementation, and, depending on teacher comfort level, we have teachers who are applying these strategies... We have these teacher leaders ... and their data speaks for itself... [They] are the early adopters sparking their change."*

Next, Ms. Alvarado visited teachers' classrooms to ensure that they deeply understood how to implement with fidelity what they had learned. In the 2017-18 school year, she visited the third- and fourth-grade classrooms to observe how teachers were effectively using the new activities, like My Favorite No, Routines for Reasoning, and Notice and Wonder. She explained:

*We're seeing a lot of [math] growth with our students who haven't had a voice. So, where teachers are seeing the best success is where they are using strategies like Notice and Wonder and really tuning in to the different core strategies and leaning heavily on the visual and hands-on components where they can.*



Lastly, Ms. Alvarado along with the teachers she coached, systematically reviewed student assessment results to uncover changes in student achievement. The following sections of this brief include student assessment data from two of the teachers that she coached: one third-grade and one fourth-grade teacher. These teachers have implemented what they have learned from Ms. Alvarado with fidelity. They are leaders in their building and frequently interact with and coach their peers. They also collaborate with other members in their PLC to continuously analyze student data and improve classroom practice.

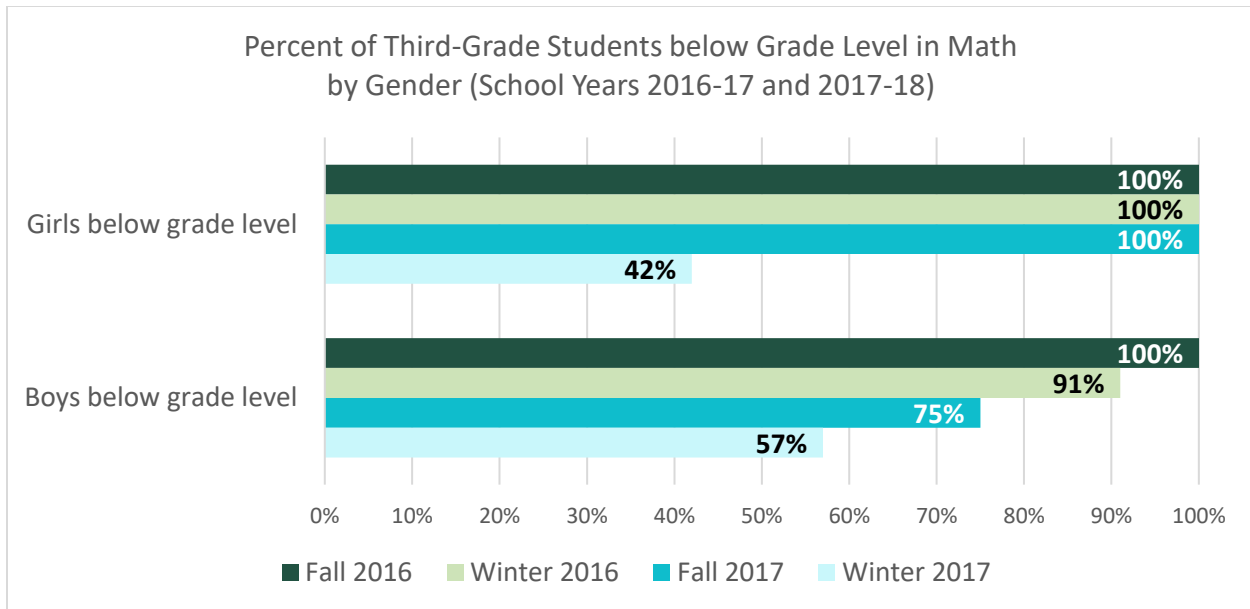
For this study, 2 years of Fall and Winter iReady math assessment data from the third- and fourth-grade teacher were compared. The 2016–17 school year assessment is the baseline and occurred before they implemented the instructional strategies learned in Ms. Alvarado’s professional development classes. The 2017–18 school year assessment results occurred after the teachers implemented the new math instructional strategies. The assessment results are reported as percent below grade level in math. Data are disaggregated by gender (boy/girl) and ethnicity (White/Non-White).

### Third-Grade Classroom

For the third-grade classroom, during the 2016-17 school year, the girls showed no growth in their understanding of math after five months of instruction between fall 2016 (100% below grade level) and winter 2016 (100% below grade level). However, the 2017-18 school year produced a markedly different growth pattern after the teacher implemented strategies to promote a mathematical mindset and culture. In fall 2017, 100% of the girls were below grade level, but only 42% remained below grade level in winter 2017.

Likewise, in the 2016-17 school year, the boys showed little improvement in their understanding of math after five months of instruction between fall 2016 (100% below grade level) and winter 2016 (91% below grade level). However, the 2017-18 school year showed noticeable improvements after the teacher implemented the new math strategies. In fall 2017, 75% of the boys were below grade level, but only 57% remained below grade level in winter 2017. Figure 1 shows third-grade results by gender for school years 2016-17 and 2017-18.

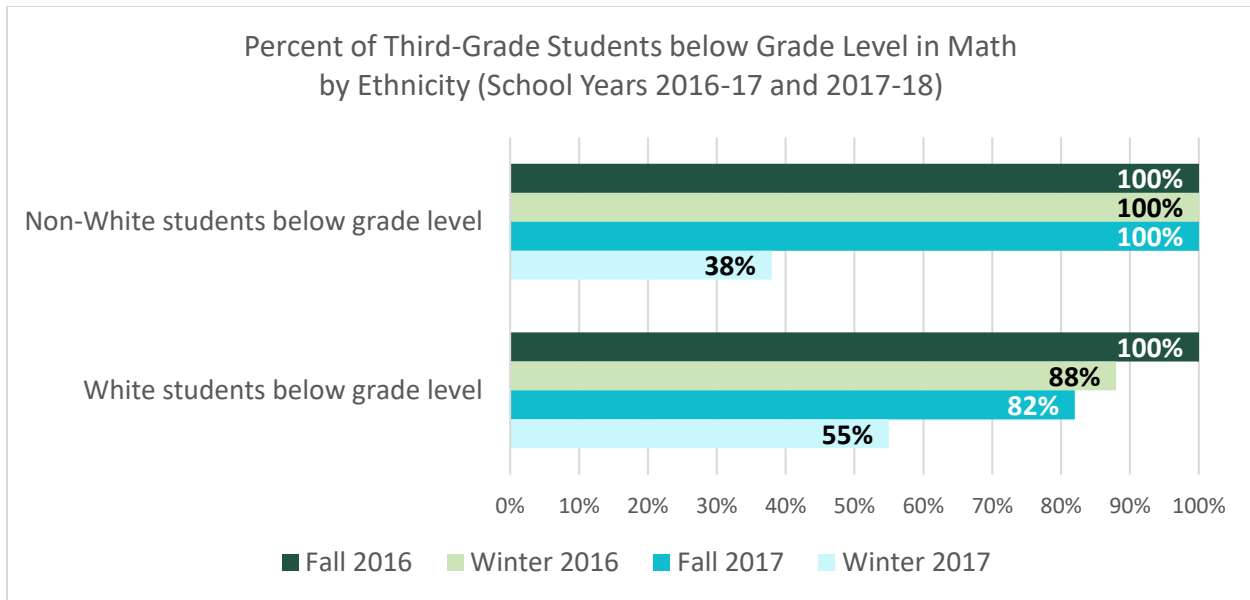
Figure 1. Percent of Third-Grade Students below Grade Level in Math by Gender (School Years 2016-17 and 2017-18)



A review of the test results by student ethnicity also revealed unprecedented growth in math understanding. In the 2016-17 school year, Non-White students showed no growth in their understanding of math after five months of instruction between fall 2016 (100% below grade level) and winter 2016 (100% below grade level). However, Non-White students showed noticeable improvement during the 2017-18 school year after the teacher implemented the new math strategies. In fall 2017, 100% of Non-White students were below grade level, but only 38% remained below grade level in winter 2017. Figure 2 shows third-grade results by ethnicity for school years 2016-17 and 2017-18.

Likewise, White students showed little improvement in their understanding of math after five months of instruction between fall 2016 (100% below grade level) and winter 2016 (88% below grade level). However, White students showed noticeable improvement during the 2017-18 school year after the teacher implemented strategies to promote a mathematical mindset and culture. In fall 2017, 82% of White students were below grade level, but only 55% of students remained below grade level in winter 2017.

Figure 2. Percent of Third-Grade Students below Grade Level in Math by Ethnicity (School Years 2016-17 and 2017-18)



The third-grade teacher reflected:

*I always believed that kids were capable of more, but I didn't realize how much I was blocking that potential with my teaching choices—when I would model and then have the students go and practice. Now I say, 'Let's see what they can do.' And then I think about how I can support them—it's about intentionally putting the learning in their hands and me diving in to see what their thinking is.*

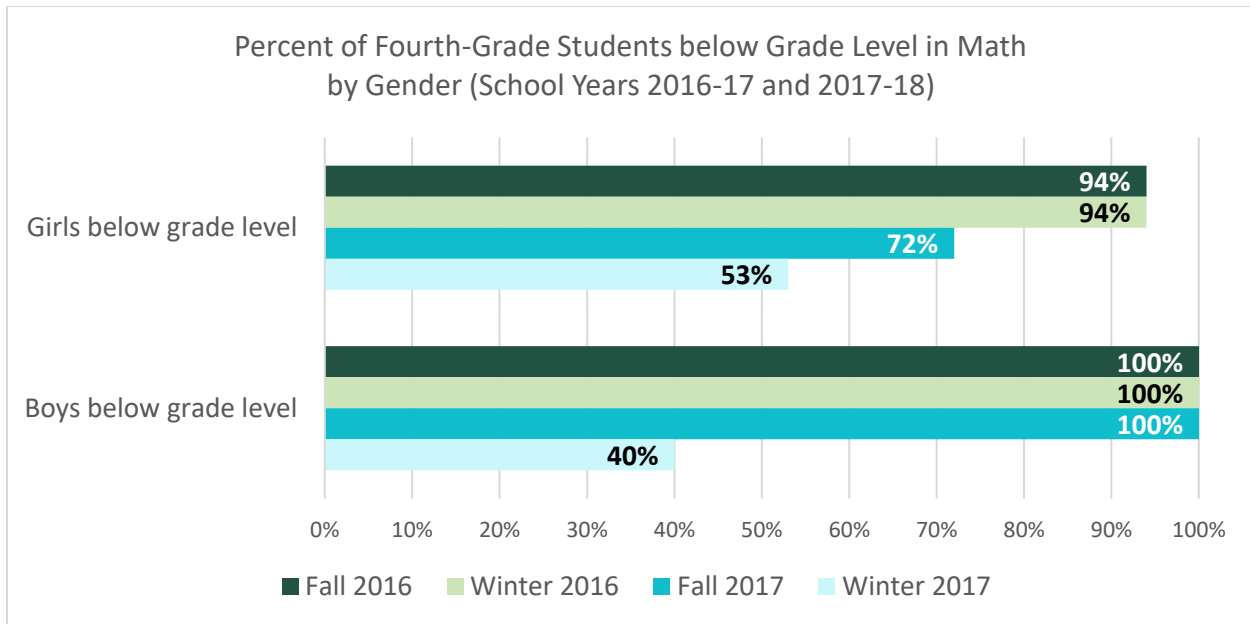
### Fourth-Grade Classroom

In the fourth-grade classroom, test results by student gender also revealed markedly different growth patterns in math understanding between school years 2016-17 and 2017-18. In the 2016-17 school year, the girls showed no growth in their understanding of math after 5 months of instruction between fall 2016 (94% below grade level) and winter 2016 (94% below grade level). However, the 2017-18 school year produced a markedly different growth pattern after the teacher implemented strategies to promote a mathematical mindset and culture. In fall 2017, 72% of the girls were below grade level, but only 53% remained below grade level in the winter 2017.

Likewise, in the 2016-17 school year, the boys showed no growth in their understanding of math after 5 months of instruction between fall 2016 (100% below grade level) and winter 2016 (100% below grade level). However, the boys showed noticeable improvement during the 2017-18 school year after the teacher implemented the new math strategies. In fall 2017, 100% of boys were below grade level, but only 40% remained below grade level in the winter 2017. Figure 3 shows fourth-grade results by gender for school years 2016-17 and 2017-18.



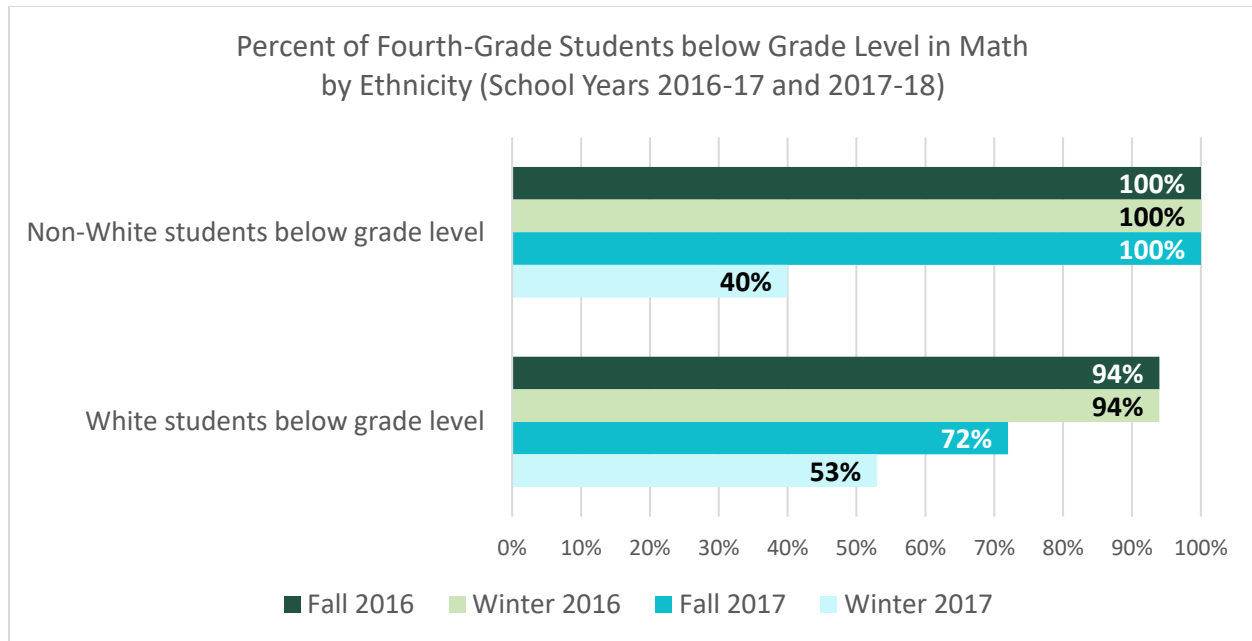
Figure 3. Percent of Fourth-Grade Students below Grade Level in Math by Gender (School Years 2016-17 and 2017-18)



A review of the test results by student race and ethnicity also revealed unprecedented growth in math understanding. In the 2016-17 school year, Non-White students showed no growth after five months of instruction between fall 2016 (100% below grade level) and winter 2016 (100% below grade level). However, Non-White students also made steep improvements between fall and winter 2017 after the teacher implemented the new math strategies. In fall 2017, 100% of Non-White students were below grade level, but only 40% remained below grade level in winter 2017. Figure 4 shows fourth-grade results by ethnicity for school years 2016-17 and 2017-18.

Likewise, in the 2016-17 school year, White students showed no growth after five months of instruction between fall 2016 (94% below grade level) and winter 2016 (94% below grade level). However, White students made steep improvements between fall and winter 2017 after the teacher implemented strategies to promote a mathematical mindset and culture. In fall 2017, 72% of White students were below grade level, but only 53% remained below grade level in winter 2017.

Figure 4. Percent of Fourth-Grade Students below Grade Level in Math by Ethnicity (School Years 2016-17 and 2017-18)



Teachers have noticed the differences in their classrooms and observed that the students appear comfortable, engaged, and seem to be visibly enjoying math. The teachers asked their students to reflect on their math class. One student said, *“We have this thing in our class that we always say, ‘When we make a mistake, our brain grows. And when you make mistakes, you learn more.’ [Our teacher] makes the challenge fun.”* Teachers have learned how to encourage productive struggle to build students’ persistence and confidence. This type of learning culture creates a safe environment that may nourishes students’ dreams. One student shared, *“Math isn’t my strongest, but I always want to try my best and keep on trying because, when I get older, I want to work for NASA.”*

## Conclusion

Professor Boaler’s *Mathematical Mindsets* is a foundational text that Ms. Alvarado first encountered through Fellows. This book was the catalyst in changing the Centralia School District’s vision and mission for mathematics. Ms. Alvarado is quick to acknowledge that this effort has been successful because of the combined support received from her ESD’s Math Regional Coordinator, Ms. Carrie Black, the Executive Director of Teaching and Learning, Kristy Vetter, and the administrators. She shared:

*I think my supervisor has a lot to do with that. So, she is the Executive Director of Teaching and Learning, and she has said from the beginning, “You know, we need to give ourselves grace [because] we are relearning math as [an] adult for ourselves. How do we hold each other up? How do we let ourselves make mistakes and then learn from them and be reflective?”*

Now, Ms. Vetter presents to the Superintendent, School Board, parent community, and a community foundation organization comprised of business leaders who want to make an impact on math learning. Ms. Alvarado will be recording math assessment scores by demographic to study how the teachers in Centralia Elementary School are closing the gap for all of their students, including recording scores by gender, ethnicity, English learners, and students with disabilities.

Inspired by the Fellows' Convening, Ms. Alvarado is planning the next stage of the work around equity. She wants to dig deeper into racial equity and guide teacher reflection by asking them if they talk about equity. She explained, "*[Some] teachers are saying 'Well, it's just a fad... It's going to come and go.' [Yes,] there's been a lot [of things] that have come and gone, so I can understand [their sentiment], but [I want to ask them] 'Can we talk at least a little bit about equity and accessibility using these strategies?'"*